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IS 11191 (1985): Methods for sampling of woollen fabrics [TXD 1: Physical Methods of Tests]

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Indian Standard

METHODS FOR SAMPLING OF WOOLLEN FABRICS

UDC 677·31·064 : 677·011 [620·113]

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

METHODS FOR SAMPLING OF WOOLLEN FABRICS

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Indian Standard

METHODS FOR SAMPLING OF WOOLLEN FABRICS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 17 January 1985, after the draft finalized by the Sampling Methods Sectional Committee had been approved by the Textile Division Council.

0.2 This standard has been prepared on the request of Wool and Wool Products Sectional Committee, TDC 4.

0.2.1 The number of tests for determination of various characteristics are based on the results of analysis of extensive amount of data collected from various organizations to ascertain the inherent variability.

0.3 In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

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1. SCOPE

1.1 This standard prescribes the methods of sampling of woollen fabrics for determination of various characteristics, namely, mass, breaking load (warp and weft), count of yarn, ends, picks, length, width, relaxation shrinkage, pH value of aqueous extract, proofing agent, colour fastness, DDT content, ether soluble matter and water penetration. It gives the number of tests for determination of breaking load and mass with specified degree of accuracy. It also lays down the criteria for ascertaining the conformity to the specified requirements for the characteristics.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Consignment — The quantity of woollen fabrics delivered to a buyer against a despatch note.

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*Rules for rounding off numerical values (*revised*).

2.2 Lot — All bales/cases/pieces or rolls of woollen fabrics of the same type and quality belonging to the same consignment.

2.3 Limit of Error of Mean — The maximum difference between the sample mean and its true value (that would be obtained if all the units in the lot were tested) at a given probability level.

2.4 Mean — The sum of observations divided by the number of observations.

2.5 Probability Level — A measure of probability associated with the sample size and limit of error of estimate. It expresses the probability that the difference between the estimate based on the sample of a particular size and its true value does not exceed the specified limit of error.

2.6 Range — The difference between the largest and the smallest observations in the sample. It is denoted by R.

> NOTE — In case the number of results in the sample is ten or more they shall be divided into sub-groups of five test results each taking them consecutively in the same order as obtained. The range of each sub-group shall then be determined with a view to obtaining the mean range.

2.7 Mean Range — The mean of values of range calculated from sub-groups of the observations in the sample (*see* **2.6**) and is denoted by $\bar{R}$.

2.8 Sample — Collection of pieces of woollen fabrics selected for inspection from a lot.

2.9 Test Specimen — A specific portion selected from a piece of woollen fabric for performing a single test.

3. SAMPLING

3.1 The pieces shall be sampled from each lot for determination of various characteristics. In order that pieces selected are representative of the lot, they shall be suitably distributed over the bales/cases in the lot. Unless otherwise agreed to between the buyer and the seller, the number of bales/cases to be taken from a lot for the purpose shall depend upon the size of the lot and shall be in accordance with Table 1.

3.2 In case the lot is not in the form of bales or cases but offered as pieces or rolls, the number of pieces or rolls to be selected from the lot for testing shall be equal to the number of tests required to be carried out according to col 2 of Table 2.

TABLE 1 NUMBER OF BALES/CASES TO BE CHOSEN FROM A LOT

(*Clause* 3.1)

No. of Bales/Cases in the Lot	No. of Bales/Cases to be Selected
(1)	(2)
2 to 15	2
16 to 50	3
51 to 100	5
101 and above	10

3.3 The bales, cases, pieces or rolls shall be selected at a random from the lot, and in order to ensure the randomness of selection IS : 4905-1968* shall be followed. The procedure for sampling shall be simple random sampling or systematic sampling as given in **3.1** and **3.3**, respectively of IS : 4905-1968*.

4. NUMBER OF TESTS

4.1 The number of tests to be made for determination of the characteristics, namely, ends, picks, count of yarn, length, width, relaxation shrinkage, pH value of aqueous extract, proofing agent, colour fastness, DDT content, ether soluble matter and water penetration, shall be according to Table 2.

TABLE 2 NUMBER OF TESTS FOR ENDS, PICKS, COUNT, LENGTH, WIDTH, RELAXATION SHRINKAGE, pH VALUE OF AQUEOUS EXTRACT, PROOFING AGENT, COLOUR FASTNESS, DDT CONTENT, ETHER SOLUBLE MATTER AND WATER PENETRATION

(*Clauses* 3.2 *and* 4.1)

No. of Pieces In the Lot	Number of Tests for	
	Count, Ends, Pick, Length and Width	Relaxation Shrinkage, pH Value of Aqueous Extract, Proofing Agent, Colour Fastness, DDT Content, Ether Soluble Matter and Water Penetration
(1)	(2)	(3)
Up to 150	8	3
151 to 500	13	5
501 to 1 000	20	8
1 001 and above	32	8

*Methods for random samplings.

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4.2 Number of tests to be made for determination of mass and breaking load (warp and weft) shall depend upon the accuracy with which they are to be determined, and are given in Table 3.

TABLE 3 NUMBER OF TESTS FOR MASS AND BREAKING LOAD

CHARACTERISTIC	LIMIT OF ERROR OF MEAN (PERCENT)			
	5	6	8	10
Mass	10	7	5	3
Breaking load (Warp and Weft)	20	15	10	5

4.2.1 Unless otherwise agreed to between the supplier and the seller, five tests for mass and ten tests for breaking load (warp and weft) shall be taken for routine testing.

4.3 The number of tests for determination of count of yarn shall be the same as that for the mass.

4.4 As far as possible, equal number of pieces or rolls shall be drawn from each selected bale.   The number of pieces or rolls taken from each bale shall be determined by dividing the number of tests to be conducted (*see* col 2 of Table 2) by the number of bales selected (*see* Table 1).

4.4.1 The number of pieces or rolls for determination of characteristics other than ends, picks, length and width shall be drawn from those which are already selected according to **3.2**.   The number of pieces or rolls to be selected shall be the same as number of tests required to be carried out for the relevant characteristics except breaking load.   In case of breaking load, the number of pieces or rolls to be selected shall be tho same as that for mass.

5. CRITERIA FOR CONFORMITY

5.1 For ascertaining the conformity of the lot to the specification requirements for the characteristics given in **4.2**, the procedure given in **5.1.1** and **5.1.2** shall be adopted. The procedure for determining the conformity of the lot is illustrated in examples in **6.1**.

5.1.1 *One-Sided Specification Limit* — The lot shall be declared as conforming to the specification if:

a) the value of expression ($\bar{x} - kR$) or ($\bar{x} - k\bar{R}$) is greater than or equal to L, when the lower specification limit L is given

<div align="center">or</div>

b) the value of the expression ($\bar{x} + kR$) or ($\bar{x} + k\bar{R}$) is less than or equal to U, when the upper specification limit U is given,

<div align="center">6</div>

Where the values of the factor k are given in Table 4 for different sample sizes, and U and L refer to the specification limits for individual test results.

5.1.2 *Two-Sided Specification Limit* — The lot shall be declared as conforming to the specification if:

a) the value of the expression $R/(U - L)$ or $\overline{R}/(U - L)$ is less than or equal to B,

b) the value of the expression $(\overline{x} + kR)$ or $(\overline{x} + k\overline{R})$ is less than or equal to U, and

c) the value of the expression $(\overline{x} - kR)$ or $(\overline{x} - k\overline{R})$ is greater than or equal to L.

Where the values of the factors B and k are given in Table 4 for different sample sizes, and U and L refer to the specification limits for individual test results.

TABLE 4   VALUES OF THE FACTORS

(*Clauses* 5.1.1 *and* 5.1.2)

SAMPLE SIZE	FACTOR	
n	k	B
(1)	(2)	(3)
3	0·5	0·9
5	0·4	0·9
7	0·4	1·0
10	0·5	0·8
15 and above	0·5	0·7

5.2 For ascertaining the conformity of the lot to the specification requirements for the characteristics given in **4.1**, the following criteria for conformity shall be adopted.

5.2.1 The lot shall be declared conforming to the requirements of the specification if the number of test results not meeting the requirements as laid down in the relevant specification does not exceed the corresponding acceptance number given in Table 5.

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TABLE 5 ACCEPTANCE NUMBERS

(*Clause* 5.2.1)

Number of Tests	Acceptance Number
(1)	(2)
3	0
5	0
8	0
13	1
20	2
32	3

6. ILLUSTRATIVE EXAMPLE

6.1 A consignment of 75 bales of flannel, hospital grey was received by a buyer who wanted to ascertain the conformity of the lot to the requirements of breaking load for warp. The material was manufactured and supplied as per the requirements of IS : 674-1973*, which specifies a minimum 65 kg of breaking load on 15 × 20 cm strip for warp. The number of bales to be chosen from 75 bales according to Table 1 is 5.

If 6 percent limit of error of mean is chosen, then according to **4.2** and Table 2, 15 tests are to be carried out. Hence following the procedure given in **4.4** (15/5) = 3 pieces or rolls are chosen from each of the selected bales. From each of the pieces thus selected, one test specimen shall be drawn and tested to determine the breaking load for warp in kg.

The observations obtained are as follows:

67	68	68	64	70
73	69	67	72	69
69	70	66	71	68

The mean of the test results is mean breaking load for

$$\text{warp} (\bar{x}) = \frac{67 + 68 + 68 + \ldots\ldots + 66 + 71 + 68}{15}$$

$$= \frac{1\,031}{15}$$

$$= 68\cdot7$$

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*Specification for flannel, hospital, grey (*second revision*)

The mean range ($\bar{R}$) is calculated by taking the ranges of the three groups, each consisting of five consecutive test results.

Thus

$$\bar{R} = \frac{6 + 6 + 5}{3} = \frac{17}{3}$$

$$= 5 \cdot 7$$

Applying the criteria of **5.1.1** we have

$$\bar{x} - k\bar{R} = 68 \cdot 7 - 0 \cdot 5 \times 5 \cdot 7$$

$$= 68 \cdot 7 - 2 \cdot 9$$

$$= 65 \cdot 8$$

Where the value of k is derived from Table 4.

Since, the criterion of **5.1.1** is satisfied, it is concluded that the lot meets the specification requirement of breaking load (warp).

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

QUANTITY	UNIT	SYMBOL	DEFINITION
Force	newton	N	$1 \ N = 1 \ kg.m/s^2$
Energy	joule	J	$1 \ J = 1 \ N.m$
Power	watt	W	$1 \ W = 1 \ J/s$
Flux	weber	Wb	$1 \ Wb = 1 \ V.s$
Flux density	tesla	T	$1 \ T = 1 \ Wb/m^2$
Frequency	hertz	Hz	$1 \ Hz = 1 \ c/s \ (s^{-1})$
Electric conductance	siemens	S	$1 \ S = 1 \ A/V$
Electromotive force	volt	V	$1 \ V = 1 \ W/A$
Pressure, stress	pascal	Pa	$1 \ Pa = 1 \ N/m^2$